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IS : 8222 - 1976

(Reaffirmed 2005)

Indian Standard
SPECIFICATION FOR
EDIBLE LEAF PROTEIN CONCENTRATE

UDC 664.38 : 631.574



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MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Price Rs **5.00**

December 1976

Indian Standard

SPECIFICATION FOR EDIBLE LEAF PROTEIN CONCENTRATE

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Indian Standard

SPECIFICATION FOR EDIBLE LEAF PROTEIN CONCENTRATE

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 30 September 1976, after the draft finalized by the Nutrition Sectional Committee had been approved by the Agricultural and Food Products Division Council.

0.2 Use of leaf protein has been suggested for many years as a means to alleviate protein shortages. Since the present availability of milk and other nutritious foods like eggs and meat is low, leaf proteins may possibly help in the alleviation of protein calorie malnutrition. The amino acid pattern of this protein shows it to be of reasonably good quality and it may be added to enrich various food formulations. Keeping this objective in view this standard has been formulated to ensure production of leaf protein of certain minimum quality.

0.2.1 Basically, the process requires cell rupture of green leaves to liberate the juice containing proteins. The juice is then separated and its proteins are coagulated. The coagulum is separated and dried.

0.3 Plants from which leaves may be taken for the production of edible leaf protein concentrate and the method by which it may be produced are suggested in Appendices A and B respectively.

0.4 In the preparation of this standard, due consideration has been given to the provisions of the Prevention of Food Adulteration Act, 1954, and the Rules framed thereunder. However, this standard is subject to the restrictions imposed under these rules, wherever applicable.

0.5 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard prescribes the requirements and the methods of sampling and test for edible leaf protein concentrate.

*Rules for rounding off numerical values (*revised*).

2. REQUIREMENTS

2.1 Description — The edible leaf protein concentrate may be a granular or powdered product ranging in colour from buff to light green. It shall be free from insect and fungus infestation, rodent contamination, dirt, grit and other extraneous matter. As far as possible it shall be free from leafy and rancid flavours. It shall also be free from toxic and heavy metals like lead, copper and arsenic, and pesticide residues.

2.2 Hygienic Conditions — The edible leaf protein concentrate shall be manufactured under hygienic conditions (*see* IS : 2491-1972*).

2.3 Protein Efficiency Ratio (PER) — The edible leaf protein concentrate shall have a corrected PER of not less than 1.5 when determined according to IS : 7481-1974†.

2.4 Aflatoxin — The edible leaf protein concentrate shall not have a total aflatoxin content more than 30 µg/kg of protein when tested according to the method prescribed in Appendix J of IS : 4684-1975‡.

2.5 The material shall also comply with the requirements given in Table 1.

TABLE 1 REQUIREMENTS FOR EDIBLE LEAF PROTEIN CONCENTRATE

SL No.	CHARACTERISTIC	REQUIREMENT	METHOD OF TEST, REF TO
(1)	(2)	(3)	(4)
i)	Moisture, percent by mass, <i>Max</i>	9.0	Appendix B of IS : 4684-1975*
ii)	Protein content ($N \times 6.25$), percent by mass, <i>Min</i>	45	IS : 7219-1973†
iii)	Total ash (on dry basis), percent by mass, <i>Max</i>	3	Appendix B of IS : 3633-1972‡
iv)	Water soluble solids, percent by mass, <i>Max</i>	1	Appendix A of IS : 4079-1967§
v)	Acid insoluble ash, percent by mass, <i>Max</i>	1	Appendix D of IS : 3633-1972‡
vi)	Crude fibre, percent by mass, <i>Max</i>	5	Appendix G of IS : 3633-1972‡

NOTE — The value for requirements as given in SI No. (ii) to (vi) are on moisture-free basis.

*Specification for edible groundnut flour (expeller pressed) (*first revision*).

†Method for determination of protein in foods and feeds.

‡Specification for tea (*first revision*).

§Specification for canned *RASOGOLLA*.

*Code for hygienic conditions for food processing units (*first revision*).

†Method for determination of protein efficiency ratio (PER).

‡Specification for edible groundnut flour (expeller pressed) (*first revision*).

2.6 Bacteriological Requirements — The edible leaf protein concentrate shall be tested periodically to comply with the requirements given in Table 2.

TABLE 2 BACTERIOLOGICAL REQUIREMENTS FOR EDIBLE LEAF PROTEIN CONCENTRATE

Sl. No.	CHARACTERISTIC	REQUIREMENT	METHOD OF TEST, REF TO
(1)	(2)	(3)	(4)
i)	Total bacterial count/g, <i>Max</i>	50000	IS : 5402-1969*
ii)	Coliform bacterial count/g, <i>Max</i>	10	IS : 5401-1969†
iii)	<i>Salmonella</i> sp.	Nil	IS : 5887-1970‡

*Method for plate count of bacteria in foodstuffs.

†Methods for detection and estimation of coliform bacteria in foodstuffs.

‡Methods for detection of bacteria responsible for food poisoning and food-borne diseases.

3. PACKAGING AND MARKING

3.1 Packaging — The edible leaf protein concentrate may be packed in accepted quantity in materials like double polyethylene lined paper bags. For shipment, multiwalled bags as used for other protein foods shall be employed.

3.2 Marking — Each container shall be suitably marked so as to give following information:

- Name of the material,
- Name and address of the manufacturer,
- Batch or code number,
- Net mass,
- Date of manufacture, and
- Any other details required under Packaged Commodities Regulation, 1975.

3.2.1 Each container may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

4. SAMPLE

4.1 The method of drawing representative samples of the material and the criteria for conformity shall be as prescribed in Appendix A of IS : 3137-1974*.

5. TESTS

5.1 Tests shall be carried out as prescribed in 2.3, 2.4, and Tables 1 and 2.

5.2 **Quality of Reagents** — Unless specified otherwise, pure chemicals and distilled water (see IS : 1070-1960†) shall be employed in tests.

NOTE — ' Pure chemicals ' shall mean chemicals that do not contain impurities which affect the test results.

A P P E N D I X A

(Clause 0.3)

LIST OF PLANT LEAVES USEFUL IN THE PRODUCTION OF EDIBLE LEAF PROTEIN CONCENTRATE

A-1. PLANTS FOR LEAF PROTEIN PRODUCTION

A-1.1 A list of plants, leaves of which are useful in the production of edible leaf protein, is given below:

COMMON NAME (1)	BOTANICAL NAME (2)
Amaranth	<i>Amaranthus gangeticus</i>
Berseem	<i>Trifolium alexandrinum</i>
Cabbage	<i>Brassica oleracea</i> var. <i>capitata</i>
Cauliflower	<i>Brassica oleracea</i> var. <i>botrytis</i>
Dhaincha	<i>Sesbacia cannabina</i>
Gajraj	<i>Pennisetum purpureum</i> , <i>typhoideum</i>
Guinea grass	<i>Panicum maximum</i>
Knol khol	<i>Brassica oleracea caulorapa</i>
Kolinji	<i>Tephrosia purpuria</i>
Lucerne	<i>Medicago sativa</i>
Napier grass	<i>Pennisetum polystachyon</i>
Pasal alkeera	<i>Spinacia oleracea</i>
Pilipesera	<i>Phaseolus trilobus</i>
Radish	<i>Raphanus sativus</i>
Rajakeera	<i>Amaranthus paniculatus</i>
Sweet potato	<i>Ipomea batatas</i>
Turnip	<i>Brassica rapa</i>
Water hyacinth	<i>Eichornia crassipes</i>
Wild grass	<i>Pennisetum pedicellatum</i>

*Specification for high protein mixes for use as food supplements (first revision).

†Specification for water, distilled quality (revised).

APPENDIX B

(Clause 0.3)

PROCESS WHICH COULD BE USED FOR THE PRODUCTION OF EDIBLE LEAF PROTEIN CONCENTRATE

B-1. PROCEDURE

B-1.1 For the purpose of extracting edible leaf protein, green leaves may be taken from the plants given in Appendix A.

B-1.2 Washed leaves should be chaffed and pulped using the pulper, used in the International Biological Programme (IBP) with bell-press and filter to separate the protein rich juice. The filtered juice is curdled by injecting steam at 90°C. The coagulum is further filtered using a standard cloth stocking and pressed by a beam press. The pressed wet cake so obtained is suspended smoothly in eight times the quantity of water to the mass of the wet cake measured in buckets. It is then acidified using lead-free 2 N hydrochloric acid until the resulting pH is 4. It is again filtered and pressed. The pressed cake is crumbled and air-dried at 40-50°C using a drying oven. The first stage drying may be done in a rotary drum drier until the moisture content is reduced to 28 percent. The second stage drying may be done in trays, after grinding the material to a fine powder. The powdered protein should be sieved to a 12.5 mm thick layer in trays and continuously dried until the moisture content is reduced to 9 percent or below.

B-1.2.1 If a bland product is desired, the pressed cake may be extracted with permitted organic solvents till free from pigment and the product then desolventized.

INDIAN STANDARDS

ON

NUTRITION

IS :

- 3137-1974 High protein mixes for use as food supplements (*first revision*)
- 4684-1975 Edible groundnut flour (expeller pressed) (*first revision*)
- 4874-1968 Cottonseed flour (expeller pressed) (*first revision*)
- 4875-1975 Edible groundnut flour (solvent extracted) (*first revision*)
- 4876-1968 Cottonseed flour (solvent extracted) (*first revision*)
- 6108-1971 Edible sesame flour (solvent extracted)
- 6109-1971 Edible sesame flour (expeller pressed)
- 7021-1973 Protein rich food supplements for infants and preschool children
- 7481-1974 Method for determination of protein efficiency ratio (PER)
- 7482-1974 Protein-based beverages
- 7487-1974 Protein-rich biscuits
- 7835-1975 Edible low-fat soya flour
- 7836-1975 Edible medium-fat soya flour
- 7837-1975 Edible full-fat soya flour
- 8211-1976 Edible soya protein isolate
- 8212-1976 Edible groundnut protein isolate
- 8220-1976 Protein-rich concentrated nutrient supplementary foods
- 8222-1976 Edible leaf protein concentrate

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